CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER NO. R2-2003-0012

FINAL SITE CLEANUP REQUIREMENTS AND RESCISSION OF ORDER NO. 98-080 FOR:

ASHLAND CHEMICAL COMPANY

for the property located at

8610 ENTERPRISE DRIVE
NEWARK, ALAMEDA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter as Regional Board), finds that:

1. **Site Location:** The Ashland Chemical Company (Ashland) is located at 8610 Enterprise Drive, Newark, Alameda County on a relatively flat 10.9-acre parcel bounded by Willow and Hickory Streets (herein referred to as "the Site"). The Site is located near tidal wetlands bordering San Francisco Bay and lies west of Highway 880, south of Highway 84 and Dumbarton Bridge, and east of Highway 101 and the salt evaporation ponds (Figure 1, Site Location Map). Land use in the vicinity of the Site has been largely industrial/commercial, but a new redevelopment plan by the City of Newark proposes high-density commercial and light industrial redevelopment for the area.

2. **Site History:** The property was purchased on September 19, 1972, by Ashland Oil Company, Inc. of Ashland, Kentucky, from the International Minerals and Chemical Corporation, of New York. Ownership was transferred to Ashland Chemical Company, Inc., a wholly owned subsidiary of Ashland Oil Company, Inc. on October 1, 1989. Ashland constructed and began operating the Site in 1973 as a storage, blending, packaging and distribution center for solvents and specialty chemicals until 2000, when the operations ceased and the facility was formally closed. The property currently has only a 24-hour security guard occupying a trailer onsite. Prior to facility closure, the Site had approximately 50 above ground storage tanks (ASTs) with storage capacities of 5,000 to 20,000 gallons, a warehouse for chemical product mixing and storage, a truck rack for the loading and unloading of solvents, a second truck rack for the loading and unloading of acid and base compounds, and several on-site drum storage areas for finished products, a storm water run-off collection pond, a 3,500-gallon tank AST for storm water run-off storage, a groundwater treatment area, acid neutralization pit, and an office building.

   The Site had a drainage ditch on the western edge of the property that was the permitted waste discharge outfall for the facility from 1973 to 1982, and received run-off from the truck rack and tank farm areas at the Site. A second unlined drainage ditch crossed the Site from its western edge (near well B-30) continuing south of the tank farm and crossing the railway lines on the property's southeastern edge to terminate near well B-20. Railroad tracks enter and follow the Site's southeastern boundary line with a railroad spur to the warehouse area. A site plan is shown as Figure 2. Four divisions operated at the Site, as follows:

- Distribution Services Organization (DSO) Division: Chemical storage, blend tanks, drum filling, bulk load rack operations and warehouse operations.
- Industrial Chemicals and Solvents (IC&S) Division: Stored, blended, repackaged, and distributed various organic chemicals, and operated mixing tanks, the truck racks, and drum fill stations in the warehouse.
- Electronic and Laboratory Products (E&LP) Division: Blending and repackaging operations for the distribution of inorganic chemicals and the production of ammonium fluoride. The distribution facilities included a truck loading rack, railcar unloading areas, truck dockyard, tank farm, warehouse, truck unloading pad and drum storage areas.
- Electronic Chemicals Division (ECD): Chemical storage, blending, drum filling and laboratory and warehouse operations. Products were mostly corrosive materials (nitric, sulfuric, hydrochloric, hydrofluoric, phosphoric, and acetic acids; ammonium hydroxide, sodium hydroxide, and potassium hydroxide, and solvents such as isopropanol).

Ashland received a permit to operate as a Hazardous Waste Facility in 1985 by Department of Health Services (DHS), predecessor to DTSC. The DHS permit authorized Ashland to store and treat hazardous wastes including solvents, acids, hydrogen peroxide and contaminated groundwater generated onsite and organics such as waste oil and mixed oil, oil/water mixture, halogenated solvents, oxygenated solvents, hydrocarbon solvents, still bottoms, and tank bottoms, inorganics such as metals, acids, bases, and asbestos, and sludges such paint, resin, ink and wastewater generated offsite. The permit expired June 27, 1990, and in a letter dated July 31, 1990, Ashland indicated its intent to officially close the permitted hazardous waste drum storage area on the site, and operate simply as a generator/transporter. Ashland had designed a diked concrete area in 1983 for temporary storage of 55-gallon drums (124 drums generated onsite and 100 from off-site), and a 3,500-gallon steel AST for groundwater separation, for temporary storage of small quantity hazardous wastes generated by its customers.

The soil and groundwater at the Site has been polluted with a wide variety of chemicals, resulting from Ashland's use and handling practices of over 600 chemicals. Unauthorized releases of chemicals contributing to the soil and groundwater pollution beneath the Site include, but are not limited to:

- A 2,000-gallon steel underground storage tank (UST), that was severely corroded and had been connected to sumps beneath the truck rack and drum filling room inside the warehouse, located on the southern perimeter of the warehouse. The tank collected spills that entered the sumps and rainwater that reached the truck rack or drum filling areas. The UST stored a wide variety of organic and halogenated solvents, flammable liquids, alcohols, and aldehydes handled at the facility. The tank was reportedly removed in 1980, and replaced with another 2,000-gallon tank.

- A 10,000-gallon holding tank reported removed in 1981 was extensively corroded along the seam welds on the lower side. During excavation for new piping, solvent-saturated soil was discovered at a depth of 6 feet below grade surface (bgs), and standing pools of solvents were visible in the pipeline trenches during an inspection on July 17, 1981. The tank was used for collection of spillage in the packing and truck loading areas.

- A spill on April 27, 1987, of 1,800 gallons of untreated, extracted VOC-impacted groundwater, some of which reached the drainage ditch onsite, was discovered during an inspection by Regional Board staff on April 28, 1987.

- A spill of 3,500 gallons of assorted solvent products in liquid form, on October 15, 1987, released by a vandal that opened 15 to 20 valves at the truck loading dock. Reportedly, approximately 2,200 gallons were recovered, and analysis of the recovered product determined the liquid contained: n-propyl acetate (10%), isobutyl acetate (2%), ethanol (7%), glycol ether (5%), toluene (5%), VM&P naptha (17%), isopropanol (3%), methanol (9%), methylene chloride (9%), n-butyl acetate (10%), lacolien (kerosene, 6%), mineral spirits (10%), aromatic 150 (5%), heavy naptha (2%), xylene (2%), and 1-1-1-trichloroethane (1%).

  The spill covered a 1-acre area along the paved and unpaved areas between the plant building and the tank farm, and pooled up on the truck loading pad and dirt areas, and in a shallow dirt ditch that drained westward as part of the storm water drainage for the site. At least 1,000 gallons of the liquid was not recovered and likely migrated to the subsurface, impacting soil and groundwater. Sampling on October 19, 1987 was conducted. Free-floating solvent product, up to three feet thick, was found in the uncapped caisson A-4 (two feet in diameter and constructed to 15 feet bgs), and Well B-10 (constructed to approximately 23 feet bgs), with less significant impacts to the other caissons (A-2, A-5, A-6, C-1, and C-2), and Well B-11 (Ecology and Environment, 1987).

- Severely polluted surface soil from the October 1987 spill was creating a discharge of polluted runoff from the Ashland Site to an adjacent drainage ditch, as witnessed by Regional Board staff during an inspection on January 29, 1988.

- Incidental spills and leaks in areas where the product was transferred, stored or otherwise handled including: the tank farm area, loading and unloading areas, the warehouse area, and along the railway area (at the outlet valve beneath the bottom of the railcar), along the railcar siding where product was transferred and exposed to air, and at the bends in the railway spur. Reportedly railcars were stored along the railway bordering the adjacent former Foster Chemical property.

3. **Named Dischargers:** Ashland Chemical Company has operated on the property since 1973 and is the current property owner. Ashland Chemical Company is named as a discharger because its activities on the site caused soil and groundwater pollution and because it was and is the property owner.

If additional information is submitted indicating that other parties caused or permitted any waste to be discharged on the site where it entered or could have entered waters of the State, the Board will consider adding that party's name to this Order.

4. **Regulatory Status:** The Site has been subject to the following Board Orders:

- NPDES No. CA0027693, issued under Waste Discharge Requirements Order Nos. 74-123, No. 79-91, No. 84-79.
- Order Nos. 89-109 and 98-080, Site Cleanup Requirements.

**5.** **Site Hydrogeology:** The Ashland Facility is located within the Alameda Creek (Niles Cone) groundwater basin. The ground surface at the Site is topographically relatively horizontal with an elevation of approximately 11 feet above Mean Sea Level (MSL), but has a general slope downward toward the southern rear portion of the property. Lithologically, the sediments beneath the Site consist of a thin layer of fill materials (brown to black stiff clay and gravelly clay) from 0 to 10 feet bgs underlain by alluvial deposits (medium to course grained sand and silty sand) from 10 to 22 feet bgs, termed the Shallow Zone for the purpose of this Order. Shallow Zone groundwater is first encountered at the Site at depths of approximately 3 to 8 feet bgs, and generally flows westerly, towards the San Francisco Bay, but onsite and offsite groundwater extraction systems and pumping by the Alameda County Water District (ACWD) can influence groundwater gradients and flow directions. Currently, the groundwater flows northeasterly in the northeastern portion of the Site, and southwesterly to southeasterly in the southern portion of the Site.

Beneath the Shallow Zone is the Newark Aquitard, the uppermost clay unit covering nearly all of the Niles subarea. The Newark Aquitard is reportedly composed of low permeable silty clay or clayey silt materials. ACWD well logs of Salinity Barrier Project (SBP) wells in the area indicate that the clay encountered at 22 feet bgs is approximately 20 to 25 feet thick and is underlain by permeable sands and gravels that constitute the Newark Aquifer. The Newark Aquitard is underlain sequentially by the following three aquifers: the Newark Aquifer, Centerville-Fremont Aquifer and the Deep Aquifer. Each is separated by an extensive clay aquitard. Beneath the Site, the Newark Aquifer, a water supply aquifer of the ACWD, consists of two separate layers of course-grained materials each about 5 to 15 feet thick and separated by a clayey zone approximately 10 to 15 feet thick (Ecology and Environment, 1987). Regionally, the Newark Aquifer typically occurs at depths of 40 to 140 feet bgs, with a thickness ranging from less than 20 feet near the San Francisco Bay to greater than 140 feet at the Hayward Fault. Groundwater gradient and flow direction in the Newark Aquifer is currently thought to vary from south to southwesterly.

The vertical hydraulic gradient between the Shallow Zone and the Newark Aquifer varies seasonally from upward to downward. Downward groundwater gradient is believed to occur during the rainy season and an upward groundwater gradient is believed to occur during the remainder of the year. Groundwater movement through the Newark Aquitard is slow under non-pumping conditions, because the Newark Aquitard has a relatively low hydraulic conductivity and the difference in elevation heads between the two aquifers is small. However, when SBP wells in the Newark Aquifer were pumped in September 1985, water levels in Shallow Zone monitoring wells at the Site dropped approximately two feet in response to sustained pumping of the Newark Aquifer at 500 gallons per minute (gpm), indicating a hydraulic connection between the two aquifers may be induced under pumping conditions.

Surface run-off from the Site is received by Plummer Creek, located 0.5 mile from the Site. Plummer Creek flows 1.2 stream miles to Newark Slough, which flows 0.25-stream miles to the San Francisco Bay. The entire drainage pathway is tidal and is lined by tidal wetlands.

Historic groundwater pumping caused over-drafting and saltwater intrusion. The natural flow of groundwater towards the San Francisco Bay was reversed, and induced the flow of saline groundwater from the nearby salt evaporation ponds and the San Francisco Bay into the inland areas. The reversed groundwater gradient may have carried pollution from one site to another, or commingled plumes in the Newark Aquifer. There is hydraulic connection between the Shallow Zone and the Newark Aquifer, the extent of which is uncertain, based on pumping tests, and the vertical migration of contaminants.

6. **Adjacent Sites:** There are three other chemical manufacturing facilities adjacent to the Site and a fourth nearby (see Figure 3) that have also polluted soil and groundwater with chemicals similar to those used by Ashland, and are conducting groundwater cleanup under Regional Board jurisdiction. FMC Corporation at 8787 Enterprise Drive lies adjacent to the north and northwest of the site and currently pumps groundwater from 17 extraction wells in the Shallow Zone and two extraction wells in the Newark Aquifer, and is currently installing a dual-phase steam-injection remedial system, under a final Site Cleanup Requirements (SCR). Former Foster Chemical Company (thereafter Romic and now owned by SHH, L.L.C.) at 37445 Willow Street lies adjacent to the south and southeast of the Site, and currently pumps groundwater from the Shallow Zone using one extraction well (EW-1). Jones-Hamilton at 8400 Enterprise Drive lies east of the Site and operated a groundwater extraction system using four wells (EW-2, EW-4, J10, and J-4R), but now implements monitored natural attenuation under a final SCR. Gallade Chemical (formerly Baron-Blakeslee/Allied Signal) at 8333 Enterprise Drive lies northeast of the Site, and used dual phase extraction to remediate soil hot spot areas and is proposing monitored natural attenuation as its final remedial plan. The contaminant plumes of FMC, Ashland, Former Foster Chemical and Jones-Hamilton sites in the Shallow Zone have commingled to some extent, but are currently being contained by groundwater extraction, as discussed in Finding 8, Interim Remedial Measures.

7. **Remedial Investigation:** Ashland first discovered the soil and groundwater pollution in 1981, during excavation for a western addition to the warehouse. Subsequent investigations conducted onsite between 1982 and 2001 detected over 45 different constituents of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in soil and Shallow Zone groundwater samples. Chemicals impacting soil and groundwater in the Shallow Zone are similar to those chemicals found in the source areas at the Ashland site and include: acetone, benzene, 2-butanone, 2-butanol, chloroform, chlorobenzene, chloroethane, chloromethane, dichloromethane, 1,1-dichloroethylene, 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethane (1,2-DCA), 1,2-dichloropropane (1,2-DCP), 1,4-dichlorobenzene, ethylbenzene, 2-hexanone, methylene chloride, methyl ethyl ketone (MEK), naphthalene, 1,1,1-trichloroethane (111-TCA), trichloroethene (TCE), toluene, tetrachloroethene (PCE), trans 1,2-dichloroethylene, total xylenes, vinyl chloride, bis (2-ethyl-hexyl) phthalate, isophorone, di-n-butylphthalate, 4-methylphenol, and di-n-octylphthalate.

a. **Soil:** Site inspections and analytical results of soil sampling for VOCs and SVOCs have confirmed that soil within the tank farm, warehouse, and loading dock areas is adversely impacted by solvents released at the Site. Laboratory analysis of soil samples for metals has not been performed, except for pH and fluorides. The vertical extent of soil pollution in the unsaturated zone extends to the depth of the groundwater, which is at 3 to 8 feet bgs, depending on seasonal variations. The aerial extent of soil pollution likely coincides with the extent of the dissolved-phase groundwater plume in the Shallow Zone. Ashland delineated a soil pollution "area of concern" (see Figure 4) based on the results of the soil investigations. The following table presents maximum concentrations of chemicals detected in the soil at the site.

| Detected Chemicals in Soil | Maximum Concentrations (mg/kg) |
|---|---|
| Acetone | 290 |
| Methylene Chloride | 220 |
| 2-butanone (MEK) | 500 |
| Toluene | 490 |
| Xylenes | 1,200 |
| 4-methyl-2-pentanone (MIBK) | 43 |
| 1,1-DCA | 31 |
| Napthalene | 130 |
| Ethyl benzene | 750 |
| Chlorobenzene | 170 |
| Bis (2-ethyl-hexyl phthalate) | 120 |
| Diesel | 260 |
| 1,2,4-Trimethyl Benzene | 100 |
| 1,1,1-TCA | 150 |
| TCE | 31 |
| 1,2-DCP | 15 |
| 1,3,5-Trimethyl Benzene | 35 |
| Benzene | 4.1 |
| Di-n-butyl-phthalate | 4.9 |
| 1,1,2,2,-PCE | 2.3 |
| Trans 1,2-DCE | 2 |
| isophorone | 3.1 |

| | |
|---|---|
| 1,1-DCE | 1.7 |
| 1,2-DCA | 1.6 |
| Isopropyl benzene | 4.2 |
| n-Propylbenzene | 10 |
| p-isopropyl toluene | 2 |

b. **Shallow Zone Groundwater**: Ashland and neighboring sites (FMC, Former Foster Chemical and Jones-Hamilton) participate in a joint groundwater monitoring program to monitor VOCS within the Shallow Zone groundwater semi-annually using 74 monitoring wells, (including Ashland's 18 onsite well and 11 offsite wells), and to generate area-wide plume maps using the 1,2-DCA data, collectively. This number of wells is currently sufficient to monitor and delineate contaminants in the Shallow Zone. The groundwater samples are currently being analyzed for SVOCs by United States Environmental Protection Agency (EPA) Method 8021B in January (1st semi-annual event), and for VOCs by EPA Method 8260B in July (2nd semi-annual event). No metals analyses for Shallow Zone groundwater samples have been performed to date to confirm or deny its presence.

Since 1982, VOCs and SVOCs have consistently been detected in the Shallow Zone groundwater at the Site. As of January 2002, VOC concentrations in Site wells include: methylene chloride at 22,000 µg/l; 1,1,1-TCA at 14,000 µg/l; cis-1,2-DCE at 18,000 µg/l; TCE at 7,500 µg/l; 1,1-DCA at 5,800 µg/l; chloroethane at 2,400 µg/l; 1,2-DCA at 1,100 µg/l; 1,2-DCP at 1,100 µg/l; vinyl chloride at 1,300 µg/l; and other VOCs at lower concentrations. During the July 2001 event, toluene at 69,000 µg/l; acetone at 50,000 µg/l; and total xylenes at 18,000 µg/l were also detected along with other VOCs at similar concentrations to those stated above.

c. **Newark Aquifer Pollution**: The pollution in the Newark Aquifer is monitored collectively by Ashland and neighboring sites (FMC, Former Foster Chemical and Jones-Hamilton), using 10 monitoring wells including Ashland's onsite wells D-1 and D-2, installed in 1989 and 1999, respectively. The number of wells is currently sufficient to monitor the lateral extent of pollution in all directions, except to the north where Well D-5 was paved over and lost and has not been sampled since 1995. Samples from D-1 are analyzed using EPA Method 8021B (1st semi-annual event) and using EPA Method 8260B (2nd semi-annual event), and samples from D-2 are analyzed quarterly using EPA Method 8260B. No metals analyses for Newark Aquifer groundwater samples have been performed to date to confirm or deny its presence. VOCs have been detected at the Site in the Newark Aquifer well D-1, located cross-gradient of the tank farm and loading bay source areas. The compound 1,2-DCA was initially detected in Well D-1 in 1991 at a concentration of 3 µg/l, but increased in January 1999 to 280 µg/l and in July 2001 to 370 µg/l. Other VOCs detected in well D-1 include, acetone (6 µg/l in 1991), methylene chloride (5 and 6 µg/l in 1994), trichloroethene (1 µg/l in 1994), 1,1,1-trichloroethane (2 µg/l in 1994 and 1 µg/l in 1998), 1,1-dichloroethane (2 µg/l in 1994), and Freon 113 (2.5 µg/l in 1999). .

VOCs have not been detected in Well D-2, which is currently monitored quarterly. Other Newark Aquifer wells offsite have also been impacted. ACWD Newark Aquifer wells E-56 and E-57 (both abandoned in March 1990) were impacted with VOCs, including but not limited to: 1,2-DCA, methylene chloride, acetone, 2-butonone (MEK), 4-methyl-1-2 pentanone (MIBK), and 1,1,1-trichloroethanene. Well E-56 was located on the downgradient western edge of the Site and E-57 was located on the upgradient eastern edge of the Site (Figure 2). In August 1981, wells E-56 and E-57 had 1,2-DCA concentrations detected at concentrations of 1,460 μg/l and 80 μg/l, respectively. The 1,2-DCA concentrations increased significantly in Well E-57 in February 1985 and November 1986, when 1,2-DCA was detected at 3,900 μg/l and 5,300 μg/l, respectively.

d. **1,2-DCA in the Newark Aquifer**: The presence of 1,2-DCA in the Newark Aquifer is due, at least in part, to releases from the Ashland site. The compound 1,2-DCA, referred to commercially as ethylene dichloride (EDC) has a high molecular weight (98.96) and high boiling point (83.84° C). 1,2-DCA (EDC) can also be used in the manufacture of other organic compounds, or as a solvent. Inventory records indicate that Ashland stored hundreds of chemicals including 1,2-DCA at the site for the reporting period of January 1 to December 31, 1987, the only year for which chemical use records were made available. On page 72 of the inventory records, EDC is listed with a CAS code of "107-06-2". The CAS code is a universal "social security number" for chemical entities (Sax, Lewis, 1986), assigned to the material by the Chemical Abstracts Service of the American Chemical Society. The CAS code links 1,2-DCA and EDC as the same chemical. The inventory record also shows the quantity stored at the Site to be between 1,000 and 9,999 pounds during 311 days in 1987. Analytical data confirms the presence of 1,2-DCA beneath the Site in soil, Shallow Zone groundwater and Newark Aquifer. Several other chemicals, as discussed in (c) above, were used by Ashland, detected in soil and Shallow ground water, and also detected in Newark Aquifer well D-1.

e. **Newark Aquitard**: The competency of the Newark Aquitard as an effective barrier to the downward migration of solvent-impacted groundwater remains questionable. Concentrations of VOCs and SVOCs have been detected in wells screened in the Newark Aquifer, including wells owned by ACWD, Ashland, FMC, Gallade Chemical, Jones-Hamilton, and former Foster Chemical.

There is hydraulic connection between the Shallow Zone groundwater and the Newark Aquifer. In September 1985, water levels in Ashland's Shallow Zone monitoring wells dropped approximately two feet in response to sustained pumping in the Newark Aquifer at a rate of 500 gallons per minute (gpm) in ACWD Salinity Barrier Project (SBP) wells (Ecology & Environment, 1988). Nine months later in June 1986 marked the first appearance of high levels of ketones (2,100,000 μg/l of acetone) in the ACWD Well E-58 in the vicinity of the site (Ecology & Environment, 1986).

A geologic cross section (west to east) through the FMC, Ashland, Former Foster Chemical, and Jones-Hamilton sites shows a distinct thinning of the aquitard (to approximately 10 feet in thickness) in the vicinity of Wells E-56, B-12 and D-1 located on Ashland's down gradient (western portion) of the property, and general variability in the thickness of the aquitard across the remaining portions of the cross section (Emcon 1989).

A potential conduit study in 1989 by Wahler Associates for Ashland stated that "large sand lenses that may occur within the Newark Aquitard and the Aquitard itself are possible natural vertical conduits, and that deep ACWD wells extending from the Shallow Zone to the Newark Aquifer represent artificial vertical conduits." Hydraulic testing performed at the Jones-Hamilton site estimated upward leakage (flux) through the Newark Aquitard to be approximately 130 gallons per day (gpd), under pumping conditions within the Shallow Zone of 580 gpd (Emcon 1990). Likewise, when the Newark Aquifer is pumped, there will be downward flux through the aquitard.

## 8. Interim Remedial Measures:

a. **Groundwater**: Ashland began implementing interim remedial measures (IRMs) in 1982 with the installation and intermittent operation of a shallow groundwater extraction system. In 1986, the system was shut down as a result of Union Sanitary District (USD) Administrative Order for repeated violations of the discharge limits. In 1990, Ashland added a groundwater treatment unit to the extraction system and resumed groundwater extraction using wells B-25, B-29, and C-2. In 1997, the system was modified and Well EW-1 was added to the system and Well B-29 was turned off. The system currently extracts groundwater at a rate of 3 to 5 gallons per minute. The groundwater is processed through an aerobic bioreactor unit, with the off-gas from the bioreactor treated through two vapor phase granulated active carbon (GAC) units installed in series prior to discharge. The treated groundwater is disposed to the sanitary sewage system with a USD permit.

The groundwater extraction and treatment system has extracted over six millions of gallons of Shallow Zone groundwater since start up. During the first semi-annual 2002 reporting period, 31 pounds of VOC mass was removed from the groundwater beneath the Site, based on the volume of water treated and the influent VOC concentrations to the treatment system (URS, 2002). Historic groundwater extraction has reportedly removed approximately 900 pounds of chlorinated solvents and ketones. Natural anaerobic degradation processes also contributed to significant mass removal as well. The prolonged groundwater extraction has resulted in concentration increases within the capture zone of the extraction wells and concentration decreases in the downgradient wells, indicating that the plume has been pulled back. The increase in vinyl chloride concentrations within the source area indicates degradation of chlorinated solvents is occurring. However, VOCs and SVOCs continue to persist at elevated levels in the Shallow Zone groundwater, likely due to low permeable soils and flow rates, and highly polluted soil in the unsaturated and saturated zones.

Migration control of the Shallow Zone contaminant plume is currently achieved by independent groundwater extraction systems operating at FMC, Ashland and Former Foster Chemical. Ashland has not operated a groundwater extraction system for the Newark Aquifer. Ashland's adjacent downgradient neighbor, FMC, operates a Newark Aquifer groundwater extraction system, which has a large capture radius, and captures the groundwater underlying the Ashland site as well. Ashland would need to remediate the Newark Aquifer beneath its site in the event that FMC stops its Newark Aquifer groundwater extraction system.

b. **Soil**: Ashland ceased operations in 2000, and is in the process of obtaining "facility closure" status from the City of Newark Fire Department, Hazardous Material Division (NFD). Removal of tanks and soil excavation performed to date are summarized below:

- 1980 - A leaking 2,000-gallon steel tank and an oil/water separator located on the southern perimeter of the warehouse were reportedly removed, but no documentation of the closure procedures or specific activities is available. The separator was part of an older wastewater treatment system that removed immiscible liquid components from waters collected throughout the facility.

- August 1985 - During expansion of the Plant, three 2000-gallon capacity USTs were removed from the site (Ecology & Environment, 1985). Tank 1 was located on the western perimeter of the warehouse, and received waste product by gravity drainage from two floor drains within the northwest end of the E&LP Division fill room inside the warehouse. Soil contamination was discovered directly beneath the 4-inch drain line entering Tank 1. Soils directly beneath the drain line were excavated to a depth of 6 feet, for a total of seven end loader bucket loads, however this soil was replaced into the excavation for future excavation. It is unknown if the impacted soil was ever removed. Tank 2 was located on the southern perimeter of the acid truck unloading area, and received rainfall runoff and product spillage from the E&LP Division truck loading rack area. Tank 3 was located on the southern perimeter of the warehouse, and received both runoff and spillage from the IC&S Division truck unloading platform and waste solvents from the IC&S Division drum filling room. The wastes stored in this tank included a wide variety of organic solvents that were handled at the facility. The drain lines for all three tanks were plugged and left in-place.

- February and March 1988 - Impacted soil (approximately 600 cubic yards) in the October 15, 1987, spill area was excavated to 1-foot bgs, except one small area that was excavated to 4-feet bgs.

- April 2000 - Ashland removed the ASTs and the associated underground pipelines in the tank farm area, which were connected to the warehouse. The excavated soil surrounding the tanks and pipelines was gravelly, saturated with chemicals, and replaced in the excavation.

To date, removal of VOC-impacted soil has been mostly limited to surface soils, as discussed above. However, the VOC-impacted soil remains a strong source of pollution at the Site and presents a threat to water quality through leaching. Only recently, in a letter dated May 21, 2002, has Ashland proposed soil excavation, but only to address facility closure requirements under the jurisdiction of the NFD. In a Soil Excavation Work Plan dated August 23, 2002, Ashland proposed removal of VOC impacted soil (unsaturated only) within the tank farm and loading rack areas, to levels at or below the industrial Preliminary Remediation Goals (PRGs updated in October 2002 by the EPA, Region 9). These goals are intended to address worker direct-exposure concerns only and are not adequate to address future leaching to shallow groundwater. The Soil Excavation Work Plan was conditionally approved by the NFD in a letter dated October 11, 2002. Implementation of the work plan will likely occur in 2003 during the dry season when groundwater is lowest. Upon completion, a post-closure report will be submitted to the NFD that documents the soil excavation and closure activities for the ASTs, USTs, and other facility operations. Additional soil remediation is needed for several reasons: to comply with Board policies requiring reasonable source control, to prevent further leaching of VOCs to shallow groundwater (which would delay attainment of shallow groundwater cleanup standards), and to reduce the threat of additional impacts to the Newark Aquifer.

**9. Environmental Risk Assessment:**

a. **Methods**: A site-specific environmental risk assessment was prepared to quantitatively evaluate the following potential concerns under a commercial/industrial land use scenario:

i. Soil
- Vapor emissions to indoor air;
- Direct exposure (ingestion, dermal absorption, inhalation of outdoor vapors and particulates);

ii. Groundwater
- Vapor emissions to indoor air;
- Vapor emissions to outdoor air;
- Impacts to drinking water.

Human heath risks posed by direct exposure emissions of vapors to indoor air were estimated through use of published USEPA models. Evaluation of potential drinking water resource concerns was carried out by comparison of groundwater data for contaminants of concern to California drinking water standards. A survey of nearby wells and deeper aquifers was also carried out. The potential for leaching of contaminants from soil and additional degradation of groundwater quality was qualitatively evaluated. Conclusions drawn from the risk assessment are provided in the July 18, 2001, Remedial Action and Cleanup Standards Report. The Board considers the following risks to be acceptable at remediation sites: a cumulative hazard index of 1.0 or less for non-carcinogens, and for carcinogens a cumulative excess cancer risk of $10^{-6}$ or less (residential scenario) or $10^{-5}$ or less (commercial/industrial scenario).

b. **Soil Assessment:** Soils at the site are heavily impacted with volatile organic compounds (refer to Finding 7). These contaminants are also found in shallow groundwater. The assessment concludes that the risk posed to construction workers and commercial/industrial workers by potential direct exposure to impacted soil does not exceed acceptable levels (i.e., target excess cancer risk of $10^{-5}$ (one in one-hundred-thousand) and target hazard index for non-carcinogenic effects of 1.0. The report concludes, however, that vapor emissions from impacted soil could cause indoor air to be impacted above acceptable levels, should buildings be constructed over the soil in the future. The assessment further concludes that contaminated soil could pose a continued threat to groundwater quality in the future should it be exposed to infiltrating surface water or should the water table rise and come into contact with impacted soil.

c. **Groundwater Assessment:** Shallow groundwater at the site is heavily impacted with volatile organic compounds (refer to Finding 7). The assessment concludes that vapor emissions from impacted groundwater poses a potential threat to indoor-air quality should buildings be constructed over the groundwater. Reported concentrations of contaminants are also well above both drinking water standards and surface water standards for the protection of aquatic life. The groundwater is not currently used as source of drinking water but directly overlies an important regional aquifer. Impacted groundwater is not known to be discharging to surface water.

d. **Recommendations:** The Remedial Action and Cleanup Standards Report recommends that the existing pump and treat system be used to control possible offsite or vertical migration of the plume. The report also recommends that vapor control systems be used in new construction to mitigate potential vapor intrusion problems from impacted soil and groundwater. The report further recommends that an asphalt or concrete cap be maintained over areas of contaminated soil in order to prevent future leaching of chemicals from the soil and additional impacts to groundwater. Ashland proposed developing a Risk Management Plan (RMP) to mitigate risks associated with residual impacts presented by chemicals in soil and groundwater at the site. Due to excessive risk that will be present at the site pending full remediation, institutional constraints are appropriate to limit on-site exposure to acceptable levels. Institutional constraints include the RMP and a deed restriction. The RMP should include a summary of environmental issues at the site, a site-specific health and safety plan (to protect workers and other receptors during intrusive activities such as construction, trenching for utilities, and dust control), description of risk management measures (such as surface capping and vapor barriers), and a description of how these measures will be implemented. The deed restriction should notify future owners of subsurface contamination, prohibit the use of shallow groundwater beneath the site as a source of drinking water until cleanup standards are met, restrict the use of property to commercial/industrial purposes, and require installation and maintenance of a vapor control system for any new construction.

10. **Feasibility Study:** Ashland completed a feasibility study as part of the Final Remedial Action and Cleanup Standards Report, dated July 18, 2001. The feasibility study evaluated cost, implementability and effectiveness when considering the following potentially applicable remedial technologies:

- Land use restrictions
- Prevent on-site use of groundwater
- Surface Capping
- Indoor-air vapor control
- Groundwater extraction/treatment
- Natural attenuation
- In-situ bioremediation
- Soil excavation and treatment disposal
- Soil vapor extraction
- Air sparging
- Dual phase extraction
- Passive treatment wall
- Physical hydraulic containment
- Wellhead treatment

11. **Cleanup Plan**: Based on the results of the feasibility study, Ashland selected (1) continued operation of the existing groundwater extraction and treatment system (with minor enhancements) as the preferred final remedial measure for Shallow Zone groundwater, followed by natural attenuation; (2) the use of an indoor-air vapor control system (vapor barrier) to mitigate potential vapor intrusion problems for future site construction and development; (3) institutional controls via a deed covenant to restrict land use and prevent onsite use of groundwater; (4) surface containment through capping; (5) continued groundwater monitoring and reporting; and (6) wellhead treatment as a contingency for the ACWD extraction wells. Additional soil remediation is needed for several reasons: to comply with Board policies requiring reasonable source control, to prevent further leaching of VOCs to shallow groundwater (which would delay attainment of shallow groundwater cleanup standards), and to reduce the threat of additional impacts to the Newark Aquifer. In addition, a proposal for Newark Aquifer remediation beneath the Ashland site is needed in the event that FMC stops operating its Newark Aquifer groundwater extraction system.

12. **Groundwater Management**: The ACWD manages groundwater resources in the Newark, Union City, and Fremont area. On average, 35% of the residents' water supply comes from groundwater, mostly from well fields located about 5 miles east of the site. ACWD's management activities address saltwater intrusion caused by past overdrafting of the Newark

Aquifer and deeper aquifers. ACWD has reversed the overdrafting by constructing artificial recharge facilities and augmenting natural Alameda Creek base flow with imported water for groundwater recharge. In addition, ACWD operates several extraction wells to remove high salinity groundwater from the Newark Aquifer and deeper aquifers within the Niles Cone (Aquifer Reclamation Program or ARP). Beginning in 2003, ACWD will treat a portion of its ARP pumpage for potable use with a desalination facility (currently under construction) at a location that is about 1.5 miles southeast of the Ashland site. ARP wells that will initially feed raw water to the desalination facility are located approximately two miles from Ashland. Hence the nearest municipal potable water well will be two miles from Ashland in 2003.

In addition to the ARP wells, ACWD initiated in the 1970's construction of an alignment of Newark Aquifer extraction wells located just inland of the salt evaporator ponds along San Francisco Bay. The barrier had been planned to extend over the entire coastal length of the Niles Cone in a general north-south direction. ACWD completed construction of five wells, including one (Site C) within 3,000 feet of the site. These wells, referred to as Salinity Barrier Project (SBP) wells, originally were envisioned to serve two functions: (i) prevent new saltwater intrusion during drought periods (when the Newark Aquifer head could drop below sea level) and (ii) hasten the removal of existing saline groundwater in the Newark Aquifer east of the SBP wells. However, under revised water management plans, ACWD does not anticipate operating these wells as a barrier curtain during droughts. Instead, these wells would more likely be operated to fulfill the second of the two objectives noted above, effectively serving as ARP wells. As part of an ongoing re-evaluation of overall project feasibility, ACWD has been reviewing operating criteria and whether or not original plans for construction of additional SBP wells should be carried out. One well, Site B, located about 1.5 miles from the Ashland site, is also being evaluated as a supply well for the desalination facility.

Chloride concentrations beneath the site in the Newark aquifer range from 15,000 to 20,000 parts per million (ppm), mainly as a result of saltwater intrusion. The site is located west (or bayward) of the proposed SBP wells alignment. Chloride concentrations therefore may not decline significantly.

However, implementing the SBP may accelerate the migration of VOCs in shallow groundwater, both laterally and vertically. If significant VOC concentrations migrate to the SBP wells, then ACWD may be required to treat SBP well pumpage prior to discharging it to surface waters or using it for beneficial use.

As ACWD plans relative to the SBP wells are currently on hold, and the chemical composition of the groundwater at the SBP wells is not known, assessment of risk to the SBP wells is not warranted at this time. A risk evaluation is needed immediately after ACWD decides to proceed with operation of SBP well Site A, Site B, or Site C, or any future ACWD water well screened in the Newark Aquifer and located less than 2 miles from the Ashland Site. Ashland must not wait for commencement of operation but must initiate the risk evaluation immediately after ACWD decides to operate one or more of the wells noted above. In evaluating this risk, Ashland will need to consider all chemicals of concern that could interfere with the ACWD ability or authorization to use (e.g., as a supply to a desalinization plant) or dispose of the extracted groundwater, as applicable.

13. **Basis for Cleanup Standards**

a. **General**: State Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," applies to this discharge and requires attainment of background levels of water quality, or the highest level of water quality which is reasonable if background levels of water quality cannot be restored. Cleanup levels other than background must be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of such water, and not result in exceedance of applicable water quality objectives. The previously-cited cleanup plan confirms the Board's initial conclusion that background levels of water quality cannot be restored. This order and its requirements are consistent with Resolution No. 68-16.

State Board Resolution No. 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304," applies to this discharge. This order and its requirements are consistent with the provisions of Resolution No. 92-49, as amended.

b. **Beneficial Uses**: The Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) on June 21, 1995. This updated and consolidated plan represents the Board's master water quality control planning document. The revised Basin Plan was approved by the State Water Resources Control Board and the Office of Administrative Law on July 20, 1995, and November 13, 1995, respectively. A summary of regulatory provisions is contained in Title 23, California Code of Regulations, Section 3912 (23 CCR 3912). The Basin Plan defines beneficial uses and water quality objectives for waters of the State, including surface waters and groundwaters.

Board Resolution No. 89-39, "Sources of Drinking Water," defines potential sources of drinking water to include all groundwater in the region, with limited exceptions for areas of high TDS yield, or naturally high contaminant levels. Groundwater underlying and adjacent to the Site qualifies as a potential source of drinking water. The Basin Plan designates the following potential beneficial uses of groundwater underlying and adjacent to the Site:

i. Municipal and domestic water supply
ii. Industrial process water supply
iii. Industrial service water supply
iv. Agricultural water supply
v. Freshwater replenishment to surface waters.

At present, there is no known use of groundwater underlying the site for the above purposes.

The existing and potential beneficial uses of the Plummer Creek, a tidal tributary of South San Francisco Bay, include:

i. Water contact and non-contact recreation
ii. Wildlife habitat
iii. Cold freshwater and warm freshwater habitat
iv. Fish migration and spawning
v. Estuarine habitat

c. **Basis for Groundwater Cleanup Standards**: The groundwater cleanup standards for the Shallow Zone groundwater and the Newark Aquifer are based on applicable water quality objectives and are the more stringent of EPA and California primary maximum contaminant levels (MCLs), or equivalent. Cleanup to this level will result in acceptable residual risk to human health and aquatic habitats.

d. **Basis for Soil Cleanup Standards**: The soil cleanup standards for the site are intended to address potential leaching of chemicals from the unsaturated zone and subsequent impact on groundwater. For the purposes of this Order, the unsaturated zone is defined as the zone above the water table's lowest historical or seasonal level, as documented or anticipated. The standards were calculated through use of an algorithm based on the computer application SESOIL. The algorithm takes into account the anticipated attenuation and dilution of chemicals in leachate as the leachate migrates downward and mixes with groundwater as well as the shallow groundwater cleanup standards.

**14.** **Future Changes to Cleanup Standards**: The goal of this remedial action is to restore the beneficial uses of groundwater underlying and adjacent to the site. Results from other sites suggest that full restoration of beneficial uses to groundwater as a result of active remediation at this site may not be possible. If full restoration of beneficial uses is not technologically nor economically achievable within a reasonable period of time, then the discharger may request modification to the cleanup standards or establishment of a containment zone, a limited groundwater pollution zone where water quality objectives are exceeded. Conversely, if new technical information indicates that cleanup standards can be surpassed, the Board may decide that further cleanup actions should be taken.

**15.** **Reuse or Disposal of Extracted Groundwater**: Board Resolution No. 88-160 allows discharges of extracted and treated groundwater from site cleanups to surface waters only if it has been demonstrated that neither reclamation nor discharge to the sanitary sewer is technically and economically feasible.

**16.** **Basis for 13304 Order**: The discharger has caused or permitted waste to be discharged or deposited where it is or probably will be discharged into waters of the State and creates or threatens to create a condition of pollution or nuisance.

17. **Cost Recovery**: Pursuant to California Water Code Section 13304, the discharger is hereby notified that the Board is entitled to, and may seek reimbursement for, all reasonable costs actually incurred by the Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this order.

18. **CEQA**: This action is an order to enforce the laws and regulations administered by the Board. As such, this action is categorically exempt from the provisions of the California Environmental Quality Act (CEQA) pursuant to Section 15321 of the Resources Agency Guidelines.

19. **Notification**: The Board has notified the discharger and all interested agencies and persons of its intent under California Water Code Section 13304 to prescribe site cleanup requirements for the discharge, and has provided them with an opportunity to submit their written comments.

20. **Public Hearing**: The Board, at a public meeting, heard and considered all comments pertaining to this discharge.

**IT IS HEREBY ORDERED**, pursuant to Section 13304 of the California Water Code, that the discharger (or its agents, successors, or assigns) shall cleanup and abate the effects described in the above findings as follows:

A. **PROHIBITIONS**

1. The discharge of wastes or hazardous substances in a manner, which will degrade water quality or adversely affect beneficial uses of waters of the State is prohibited.

2. Further significant migration of wastes or hazardous substances through subsurface transport to waters of the State is prohibited.

3. Activities associated with the subsurface investigation and cleanup, which will cause significant adverse migration of wastes or hazardous substances are prohibited.

B. **CLEANUP PLAN AND CLEANUP STANDARDS**

1. **Implement Cleanup Plan**: The discharger shall implement the cleanup plan described in Finding 11.

2. **Soil and Groundwater Cleanup Standards**: The following soil cleanup standards shall be met throughout the unsaturated zone soil at the site. For the purposes of this Order, the unsaturated zone is defined as the zone above the water table's lowest historical or seasonal level, as documented or anticipated. The cleanup levels shall be confirmed with confirmatory soil samples prior to system curtailment. The following groundwater cleanup standards shall be met throughout

the area of impacted groundwater, and in all groundwater monitoring wells identified in the Self-Monitoring Program:

| CHEMICALS OF CONCERN | SOIL CLEANUP STANDARDS Commercial/ Industrial Land Use Only (a) (mg/kg) | GROUNDWATER CLEANUP STANDARDS (ug/L) |
|---|---|---|
| Acetone | 0.24 | 700 (d) |
| Benzene | 0.045 | 1.0 (b) |
| Bis(2-ethylhexyl)phthalate | 200 | 12 (c) |
| Bromoform | 2.2 | 100 (b) |
| Carbon Tetrachloride | 0.11 | 0.50 (b) |
| Chlorobenzene | 3.0 | 50 (f) |
| Chloroethane | 0.85 | 12 (c) |
| Chloroform | 0.88 | 100 (b) |
| Chloromethane | 0.42 | 2.7 (c) |
| Dichlorobenzene, 1,2- | 0.75 | 600 (b) |
| Dichlorobenzene, 1,3- | 0.47 | 6.3 (d) |
| Dichlorobenzene, 1,4- | 0.59 | 5.0 (b) |
| Dichloroethane, 1,1- | 0.22 | 5.0 (b) |
| Dichloroethane, 1,2- | 0.006 | 0.50 (b) |
| Dichloroethylene, 1,1- | 1.0 | 6.0 (b) |
| Dichloroethylene, Cis 1,2- | 0.19 | 6.0 (b) |
| Dichloroethylene, Trans 1,2- | 0.65 | 10.0 (b) |
| Dichlorophenol, 2,4- | 0.30 | 0.30 (f) |
| Dichloropropane, 1,2- | 0.13 | 5.0 (b) |
| Dichloropropane, 1,3- | 0.057 | 0.50 (b) |
| 1,4 Dioxane | 0.0018 | 3.0 (g) |
| Ethylbenzene | 2.5 | 30 (e) |
| Methylene Chloride | 0.076 | 5.0 (b) |
| Methyl Ethyl Ketone | 3.8 | 4200 (d) |
| Methyl Isobutyl Ketone | 2.7 | 120 (h) |
| Napthalene | 4.3 | 21 (f) |
| Styrene | 1.7 | 10 (e) |
| Tetrachloroethane, 1,1,1,2- | 0.020 | 1.3 (c) |
| Tetrachloroethane, 1,1,2,2- | 0.015 | 1.0 (b) |
| Tetrachloroethylene | 0.80 | 5.0 (b) |
| Toluene | 2.6 | 40 (e) |
| Trichlorobenzene, 1,2,4- | 15 | 70 (b) |
| Trichloroethane, 1,1,1- | 8.0 | 200 (b) |
| Trichloroethane, 1,1,2- | 0.091 | 5.0 (b) |
| Trichloroethylene | 0.40 | 5.0 (b) |
| Vinyl Chloride | 0.086 | 0.50 (b) |
| Xylenes | 1.0 | 20 (e) |

Notes:

The cleanup standards noted above are referenced in the Application of Risk-Based Screening Levels and Decision Making to Sites With Impacted Soil and Groundwater (RWQCB, San Francisco Bay Region).

(a) Soil cleanup standard based on groundwater protection (soil leaching).

(b) Groundwater cleanup standard based on California DHS primary MCL.

(c) Groundwater cleanup standard based on carcinogenic risk using DHS model.

(d) Groundwater cleanup standard based on non-carcinogenic risk using DHS model.
(e) Groundwater cleanup standard based on USEPA Secondary MCL
(f) Groundwater cleanup standard based on taste and odor, Amoore & Hauthala (1983) or Ontario MOEE (1996).
(g) Groundwater cleanup standard based on Cal OEHHA public health goal.
(h) Groundwater cleanup standard based on Cal DHS action level.

## C. TASKS

### 1. WORKPLAN TO ENHANCE THE EXISTING PUMP AND TREAT SYSTEM

COMPLIANCE DATE: March 1, 2003

Submit a workplan acceptable to the Executive Officer to enhance the existing groundwater pump and treatment system, including additional pumping wells to remove VOCs from the soil and Shallow Zone groundwater. The workplan shall describe all significant implementation steps and provide an implementation schedule.

### 2. PROPOSED INSTITUTIONAL CONSTRAINTS

COMPLIANCE DATE: March1, 2003

Submit a technical report acceptable to the Executive Officer documenting procedures to be used by the discharger, and future owners and associated occupants of the site, to prevent or minimize human exposure to soil and groundwater contamination prior to meeting cleanup standards. Such procedures shall include a deed restriction prohibiting the use of shallow zone groundwater and Newark aquifer groundwater as a source of drinking water and prohibiting residential uses. The technical report shall also include a detailed Risk Management Plan (RMP) and a fact sheet to manage risks posed by residual contaminants in soil and groundwater at the Site, including a site-specific health and safety plan to address current site conditions, as well as any future site development. The RMP shall address risk management for the entire site and be used by current and future owners and occupants. In its current condition, while undergoing soil and groundwater remediation, the RMP shall include a site-specific health and safety plan to establish protocols to protect the persons conducting onsite intrusive activities (i.e., trenching for the installation of subsurface utilities, dust control, dewatering, equipment decontamination, excavation, loading, and transport of contaminated soil and water), and any person onsite or offsite having the potential for exposure to residual chemicals in soil, groundwater, or vapors.

During future site development, the RMP would be used to describe risk control measures inherent in the final remedial actions, such as the implementation of institutional controls, surface capping, engineered controls in buildings to mitigate potential vapor intrusion, and a deed restriction that prohibits the use of groundwater in the Shallow Zone and Newark aquifers as a source of drinking water and prohibits residential uses. After development, future owners and occupants shall use the RMP to address long-term management plans of any residual chemicals at the site and assurance that the institutional controls (i.e., vapor barrier, surface cap, deed restriction, etc) are implemented properly and maintain integrity through time.

3. **IMPLEMENTATION OF INSTITUTIONAL CONSTRAINTS**

   COMPLIANCE DATE: June 1, 2003

   Submit a technical report acceptable to the Executive Officer documenting that the proposed institutional constraints have been implemented and submit a copy of the recorded deed restriction.

4. **IMPLEMENTATION OF FINAL REMEDIAL MEASURES**

   COMPLIANCE DATE: July 1, 2003

   Submit a technical report acceptable to the Executive Officer documenting implementation of the Task 1 Workplan. The report should document the system enhancement and startup (as opposed to completion) and should present initial results on system effectiveness.

5. **WORKPLAN FOR ADDITIONAL SOURCE REMOVAL**

   COMPLIANCE DATE: December 1, 2003

   Submit a workplan acceptable to the Executive Officer to evaluate the success of the soil excavation in meeting the soil cleanup standards in the order, and to propose further remedial measures to ensure that the cleanup standards in this order are attained within a timely manner (less than 2 years). The workplan shall describe all significant implementation steps and provide an implementation schedule.

6. **IMPLEMENTATION OF ADDITIONAL SOURCE REMOVAL**

   COMPLIANCE DATE: As approved by the Executive Officer
   Submit a technical report acceptable to the Executive Officer documenting implementation of the Task 5 Workplan, including detailed cross sections with post-remedial confirmation soil sampling data.

7. **FIVE-YEAR STATUS REPORT**

   COMPLIANCE DATE: August 1, 2008
   and every 5-years thereafter

   Submit a technical report acceptable to the Executive Officer evaluating the effectiveness of the approved cleanup plan. The report should include:

   a. Summary of effectiveness in controlling contaminant migration and protecting human health and the environment.

b. Comparison of contaminant concentration trends with cleanup standards.
c. Comparison of anticipated versus actual costs of cleanup activities.
d. Performance data (e.g. groundwater volume extracted, chemical mass removed, mass removed per million gallons extracted).
e. Cost effectiveness data (e.g. cost per pound of contaminant removed).
f. Summary of additional investigations (including results) and significant modifications to remediation systems.
g. Additional remedial actions proposed to meet cleanup standards (if applicable) including time schedule.

If cleanup standards have not been met and are not projected to be met within a reasonable time, the report should assess the technical practicability of meeting cleanup standards and may propose an alternative cleanup strategy.

8. **WORKPLAN FOR ALTERNATE CLEANUP PLAN (CONTINGENCY)**

COMPLIANCE DATE: 90 days after requested by the Executive Officer

Submit a work plan acceptable to the Executive Officer for plume migration control of the Newark Aquifer in the event that FMC Corporation ceases operation of its existing Newark Aquifer groundwater extraction and treatment system currently capturing contaminants beneath the Ashland site. The work plan shall ensure capture of the plume to the fullest extent practicable including the boundaries of the entire Ashland site.

9. **IMPLEMENTATION OF ALTERNATE CLEANUP METHOD**

COMPLIANCE DATE: 250 days after Executive Officer approval of Task 8 Work Plan

Submit a technical report acceptable to the Executive Officer documenting completion of necessary tasks specified in Task 8 Workplan, including effectiveness of controlling contaminant migration in the Newark Aquifer, and protecting human health and the environment; a summary of significant modifications to the remedial system, if warranted, and additional remedial actions proposed to meet cleanup standards (if applicable) including time schedule.

10. **PROPOSED CURTAILMENT**

COMPLIANCE DATE: 60 days prior to proposed curtailment

Submit a technical report acceptable to the Executive Officer containing a proposal to curtail remediation. Curtailment includes system closure (e.g. well abandonment), system suspension (e.g. cease extraction but wells retained), significant system modification (e.g. major reduction in extraction rates, closure of individual extraction wells within extraction network), and confirmation soil borings across the site for collection of soil samples to confirm effectiveness of the soil remediation. The report should include the rationale for curtailment. Proposals for final closure should demonstrate that groundwater contaminant concentrations are stable, and contaminant migration potential is minimal, and that cleanup standards for soil and groundwater have been met.

11. **IMPLEMENTATION OF CURTAILMENT**

COMPLIANCE DATE: 60 days after Executive Officer approval of Task 11 Report

Submit a technical report acceptable to the Executive Officer documenting completion of the tasks identified in Task 11.

12. **EVALUATION OF NEW HEALTH CRITERIA**

COMPLIANCE DATE: 90 days after request by Executive Officer

Submit a technical report acceptable to the Executive Officer evaluating the effect on the approved cleanup plan of revising one or more cleanup standards in response to revision of drinking water standards, maximum contaminant levels, or other health-based criteria.

13. **EVALUATION OF NEW TECHNICAL INFORMATION**

COMPLIANCE DATE: 90 days after request by Executive Officer

Submit a technical report acceptable to the Executive Officer evaluating new technical information bearing on the approved cleanup plan and cleanup standards for this site. In the case of a new cleanup technology, the report should evaluate the technology using the same criteria used in the feasibility study. Such technical reports shall not be requested unless the Executive Officer determines that the new information is reasonably likely to warrant a revision in the approved cleanup plan or cleanup standards.

14. **REVISED RISK ASSESSMENT**

COMPLIANCE DATE: 90 days after request by Executive Officer

Submit a revised risk assessment acceptable to the Executive Officer in the event that ACWD decides to proceed with operation of any water well screened in the Newark Aquifer and located less than 2 miles from the Ashland site, including but not limited to the SBP well Site A, Site B, or Site C, as detailed in Finding 12, Groundwater Management.

## 15. DELAYED COMPLIANCE

If the discharger is delayed, interrupted, or prevented from meeting one or more of the completion dates specified for the above tasks, the discharger shall promptly notify the Executive Officer and the Board may consider revision to this Order.

## D. PROVISIONS

1. **No Nuisance**: The storage, handling, treatment, or disposal of polluted soil or groundwater shall not create a nuisance as defined in California Water Code Section 13050(m).

2. **Good Operation & Maintenance**: The discharger shall maintain in good working order and operate as efficiently as possible any facility or control system installed to achieve compliance with the requirements of this Order.

3. **Cost Recovery**: The discharger shall be liable, pursuant to California Water Code Section 13304, to the Board for all reasonable costs actually incurred by the Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this Order. If the site addressed by this Order is enrolled in a State Board-managed reimbursement program, reimbursement shall be made pursuant to this Order and according to the procedures established in that program. Any disputes raised by the discharger over reimbursement amounts or methods used in that program shall be consistent with the dispute resolution procedures for that program.

4. **Access to Site and Records**: In accordance with California Water Code Section 13267(c), the discharger shall permit the Board or its authorized representative:

    a. Entry upon premises in which any pollution source exists, or may potentially exist, or in which any required records are kept, which are relevant to this Order.

    b. Access to copy any records required to be kept under the requirements of this Order.

    c. Inspection of any monitoring or remediation facilities installed in response to this Order.

    d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the discharger.

5. **Self-Monitoring Program**: The discharger shall comply with the Self-Monitoring Program as attached to this Order and as may be amended by the Executive Officer.

6. **Contractor / Consultant Qualifications**: All technical documents shall be signed by and stamped with the seal of a California registered geologist, a California certified engineering geologist, or a California registered civil engineer.

7. **Lab Qualifications**: All samples shall be analyzed by State-certified laboratories or laboratories accepted by the Board using approved EPA methods and appropriate laboratory detection limits for the type of analysis to be performed. All laboratories shall maintain quality assurance/quality control (QA/QC) records for Board review. This provision does not apply to analyses that can only reasonably be performed on-site (e.g. temperature).

8. **Document Distribution**: Copies of all correspondence, technical reports, and other documents pertaining to compliance with this Order shall be provided to the following agencies:

   a. City of Newark Fire Department (Hazardous Materials Division)
   b. Alameda County Water District (Groundwater Resources Division)
   c. Department of Toxic Substances Control (Standardized Permits and Corrective Action Branch)

   The Executive Officer may modify this distribution list as needed.

9. **Reporting of Changed Owner or Operator**: The discharger shall file a technical report on any changes in site occupancy or ownership associated with the property described in this Order.

10. **Reporting of Hazardous Substance Release**: If any hazardous substance is discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, the discharger shall report such discharge to the Regional Board by calling (510) 622-2300 during regular office hours (Monday through Friday, 8:00 to 5:00). A written report shall be filed with the Board within five working days. The report shall describe: the nature of the hazardous substance, estimated quantity involved, duration of incident, cause of release, estimated size of affected area, nature of effect, corrective actions taken or planned, schedule of corrective actions planned, and persons/agencies notified. This reporting is in addition to reporting to the Office of Emergency Services required pursuant to the Health and Safety Code.

11. **Rescission of Existing Order**: This Order supercedes and rescinds Order No. 98-080.

12. **Periodic SCR Review**: The Board will review this Order periodically and may revise it when necessary.

I, Loretta K. Barsamian, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on January 22, 2003.

Loretta K. Barsamian
Executive Officer

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FAILURE TO COMPLY WITH THE REQUIREMENTS OF THIS ORDER MAY SUBJECT YOU TO ENFORCEMENT ACTION, INCLUDING BUT NOT LIMITED TO: IMPOSITION OF ADMINISTRATIVE CIVIL LIABILITY UNDER WATER CODE SECTIONS 13268 OR 13350, OR REFERRAL TO THE ATTORNEY GENERAL FOR INJUNCTIVE RELIEF OR CIVIL OR CRIMINAL LIABILITY

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Attachments: Self-Monitoring Program
Site Location Map (Figure 1)
Site Plan (Figure 2)
Map Showing Five VOC-Impacted Sites (Figure 3)
Schematic of Area of Concern for VOC-Impacted Soil (Figure 4)

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

SELF-MONITORING PROGRAM
FOR:
ASHLAND CHEMICAL COMPANY
for the property located at
8610 ENTERPRISE DRIVE
NEWARK, ALAMEDA COUNTY

1. **Authority and Purpose**: The Board requests the technical reports required in this Self-Monitoring Program pursuant to Water Code Sections 13267 and 13304. This Self-Monitoring Program is intended to document compliance with Board Order No. 03-012 (Site Cleanup Requirements).

2. **Monitoring**: The discharger shall measure groundwater elevations quarterly in all monitoring wells, and shall collect and analyze representative groundwater samples according to the Table on the following page:

   The following field parameters shall be monitored on-site during collection of groundwater monitoring wells: temperature, pH, conductivity, and dissolved oxygen.

   The discharger shall sample any new monitoring or extraction wells or extraction wells quarterly during the first year and semi-annually thereafter and analyze groundwater samples for the same constituents as shown in the above table. The discharger may propose changes in the above table; any proposed changes are subject to Executive Officer approval.

3. **Semi-Annual Monitoring Reports**: The discharger shall submit semi-annual monitoring reports to the Board no later than 30 days following the end of the semi-annual period (e.g. report for July through December period due January 31). The first semi-annual monitoring report shall be due on January 31, 2003. The reports shall include:

   a. Transmittal Letter: The transmittal letter shall discuss any violations during the reporting period and actions taken or planned to correct the problem. The letter shall be signed by the discharger's principal executive officer or his/her duly authorized representative, and shall include a statement by the official, under penalty of perjury, that the report is true and correct to the best of the official's knowledge.

   b. Groundwater Elevations: Groundwater elevation data shall be presented in tabular form, and a groundwater elevation map should be prepared for each monitored water-bearing zone. Historical groundwater elevations shall be included in the second semi-annual report each year.

| Well No. | Sampling Frequency | Analyses by EPA Methods | Water Bearing Zone | Remarks |
|---|---|---|---|---|
| B-1 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-2 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-3 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-4 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-5 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-6 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-7 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-8 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-9 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-11 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-12 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-13 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-23 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-24 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-25 | Semi-Annual | 8260B, 8270B | Shallow | Extraction Well |
| B-26 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-27 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-28 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-29 | Semi-Annual | 8260B, 8270B | Shallow | Former Extraction Well |
| B-30 | Semi-Annual | 8260B, 8270B | Shallow | |
| B-31 | Semi-Annual | 8260B, 8270B | Shallow | |
| C-2 | Semi-Annual | 8260B, 8270B | Shallow | Extraction Well |
| EW-1 | Semi-Annual | 8260B, 8270B | Shallow | Extraction Well |
| W-16 | Semi-Annual | 8260B, 8270B | Shallow | |
| W-16 | Semi-Annual | 8260B, 8270B | Shallow | |
| W-21 | Semi-Annual | 8260B, 8270B | Shallow | |
| W-22 | Semi-Annual | 8260B, 8270B | Shallow | |
| W-25 | Semi-Annual | 8260B, 8270B | Shallow | |
| W-26 | Semi-Annual | 8260B, 8270B | Shallow | |
| D-1 | Semi-Annual | 8260B, 8270B | Newark | |
| D-2 | Semi-Annual | 8260B, 8270B | Newark | |

Notes:
Analysis for volatile organic compounds using EPA Method 8260B, in July (2nd semi-annual event).
Analysis for semi-volatile organic compounds using EPA Method 8270B, in January (1st semi-annual event).

c. Groundwater Analyses: Laboratory analytical methods shall use low detection limits (less than or equal to cleanup standards), unless sample dilution is necessary. Groundwater sampling data shall be presented in tabular form, and an isoconcentration map should be prepared for one or more key contaminants for each monitored water-bearing zone, as appropriate. The report shall indicate the analytical method used, detection limits obtained for each reported constituent, and a summary of QA/QC data. Historical groundwater sampling results shall be included in the second semi-annual report each year. The report shall describe any significant increases in contaminant concentrations since the last report, and any measures proposed to address the increases. Supporting data, such as lab data sheets, need not be included (however, see record keeping - below).

d. Groundwater Extraction: If applicable, the report shall include groundwater extraction results in tabular form, for each extraction well and for the site as a whole, expressed in gallons per minute and total groundwater volume for the period. The report shall also include contaminant removal results, from groundwater extraction wells and from other remediation systems (e.g. soil vapor extraction), expressed in units of chemical mass per day and mass for the period. Historical mass removal results shall be included in the second semi-annual report each year.

e. Status Report: The semi-annual report shall describe relevant work completed during the reporting period (e.g. site investigation, interim remedial measures) and work planned for the following period.

f. Additional constituent sampling, analysis, and reporting: A one-time analysis for other constituents shall be conducted at representative monitoring wells. Other constituents include: Title 22 Metals using EPA Methods 3010/3050 and 6010/7400, Phthalate Esters using EPA Method 8060 by GCMS, and Phenols using EPA Method 8040A by GCMS. A workplan acceptable to the Executive Officer shall be submitted by March 1, 2003; the workplan shall identify which monitoring wells will be sampled for each constituent category. A technical report containing the results of the one-time effort and acceptable to the Executive Officer shall be submitted by August 1, 2003. The report shall also include a proposal for regular sampling and analysis of any constituents detected at levels of concern during the one-time effort.

4. **Violation Reports**: If the discharger violates requirements in the Site Cleanup Requirements, then the discharger shall notify the Board office by telephone as soon as practicable once the discharger has knowledge of the violation. Board staff may, depending on violation severity, require the discharger to submit a separate technical report on the violation within five working days of telephone notification.

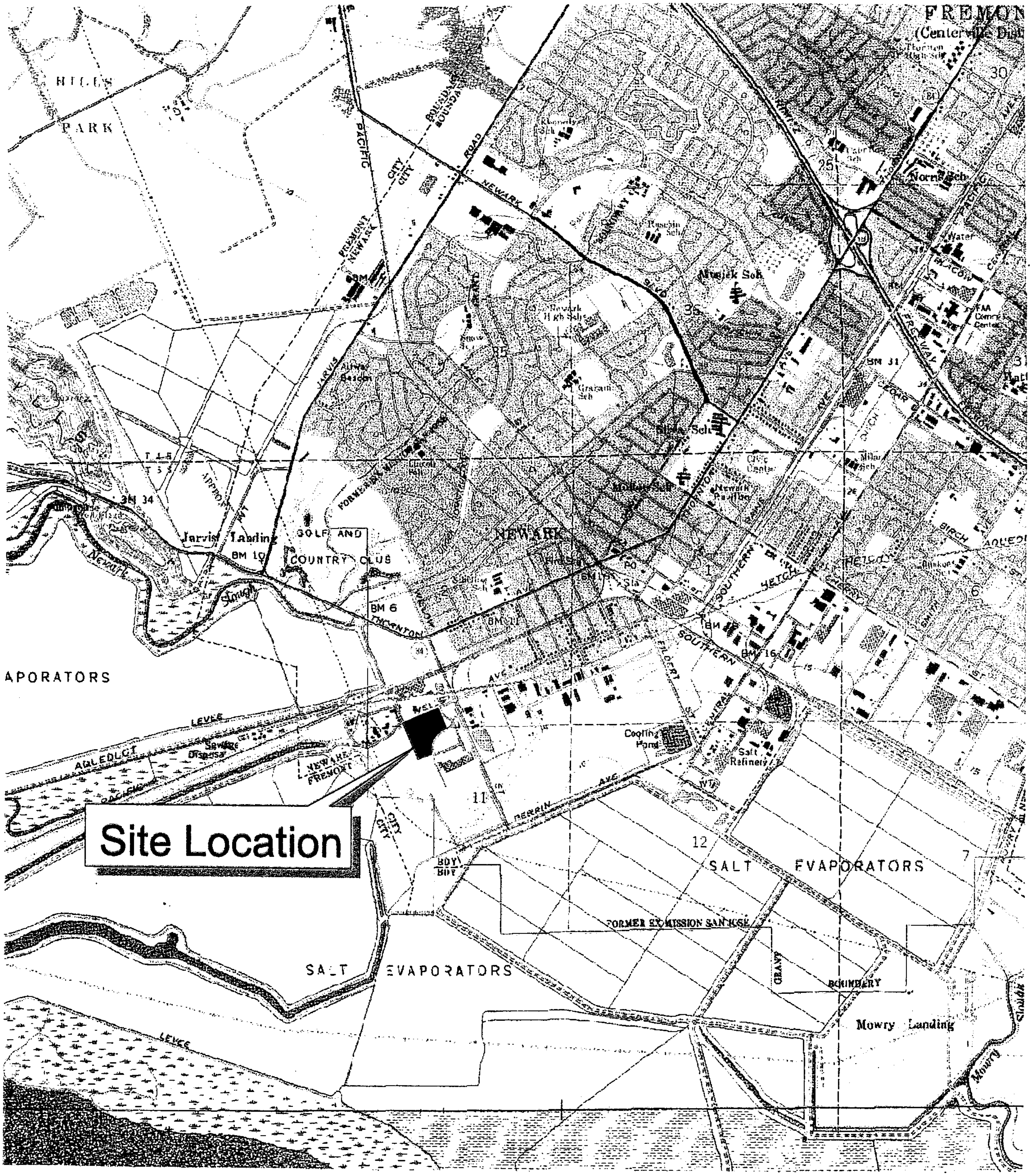
5. **Other Reports**: The discharger shall notify the Board in writing prior to any site activities, such as construction or underground tank removal, which have the potential to cause further migration of contaminants or which would provide new opportunities for site investigation.

6. **Record Keeping**: The discharger or his/her agent shall retain data generated for the above reports, including lab results and QA/QC data, for a minimum of six years after origination and shall make them available to the Board upon request.

7. **SMP Revisions**: Revisions to the Self-Monitoring Program may be ordered by the Executive Officer, either on his/her own initiative or at the request of the discharger. Prior to making SMP revisions, the Executive Officer will consider the burden, including costs, of associated self-monitoring reports relative to the benefits to be obtained from these reports.

I, Loretta K. Barsamian, Executive Officer, hereby certify that this Self-Monitoring Program was adopted by the Board on January 22, 2003.

Loretta K. Barsamian
Executive Officer



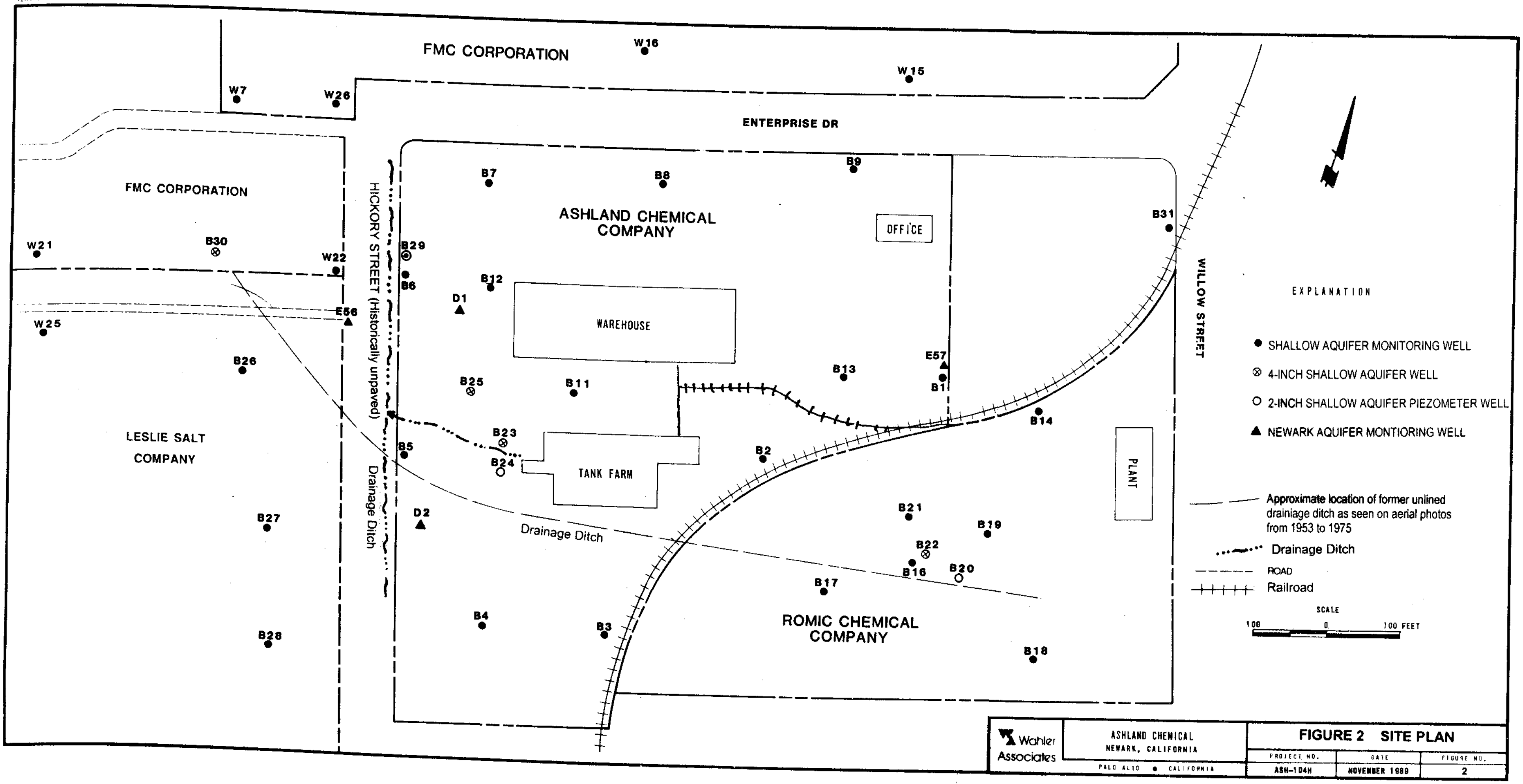

Source: U.S.G.S. 7.5' Quad Sheet
Newark, California

2000 0 2000 4000 Feet

N

Jan. 31, 1999

| | | |
|---|---|---|
| Project No. 70984W491 | Ashland Chemical, Inc. 8600 Enterprise Dr. Newark, California | SITE LOCATION MAP |
| URS Greiner Woodward Clyde | | Figure 1 |



FMC CORPORATION
ENTERPRISE DR
WILLOW STREET
HICKORY STREET (Historically unpaved)
Drainage Ditch
Drainage Ditch
ASHLAND CHEMICAL COMPANY
OFFICE
WAREHOUSE
TANK FARM
PLANT
ROMIC CHEMICAL COMPANY
FMC CORPORATION
LESLIE SALT COMPANY
W7
W26
W16
W15
W21
W22
W25
B30
E56
B26
B27
B28
B29
B6
B7
B8
B9
B12
D1
B25
B11
B23
B24
B5
D2
B4
B3
B2
B13
E57
B1
B31
B14
B21
B19
B22
B16
B20
B17
B18
EXPLANATION
SHALLOW AQUIFER MONITORING WELL
4-INCH SHALLOW AQUIFER WELL
2-INCH SHALLOW AQUIFER PIEZOMETER WELL
NEWARK AQUIFER MONTIORING WELL
Approximate location of former unlined drainiage ditch as seen on aerial photos from 1953 to 1975
Drainage Ditch
ROAD
Railroad
SCALE
100 0 100 FEET
Wahler Associates
ASHLAND CHEMICAL
NEWARK, CALIFORNIA
PALO ALTO • CALIFORNIA
FIGURE 2 SITE PLAN
PROJECT NO. ASH-104H
DATE NOVEMBER 1989
FIGURE NO. 2

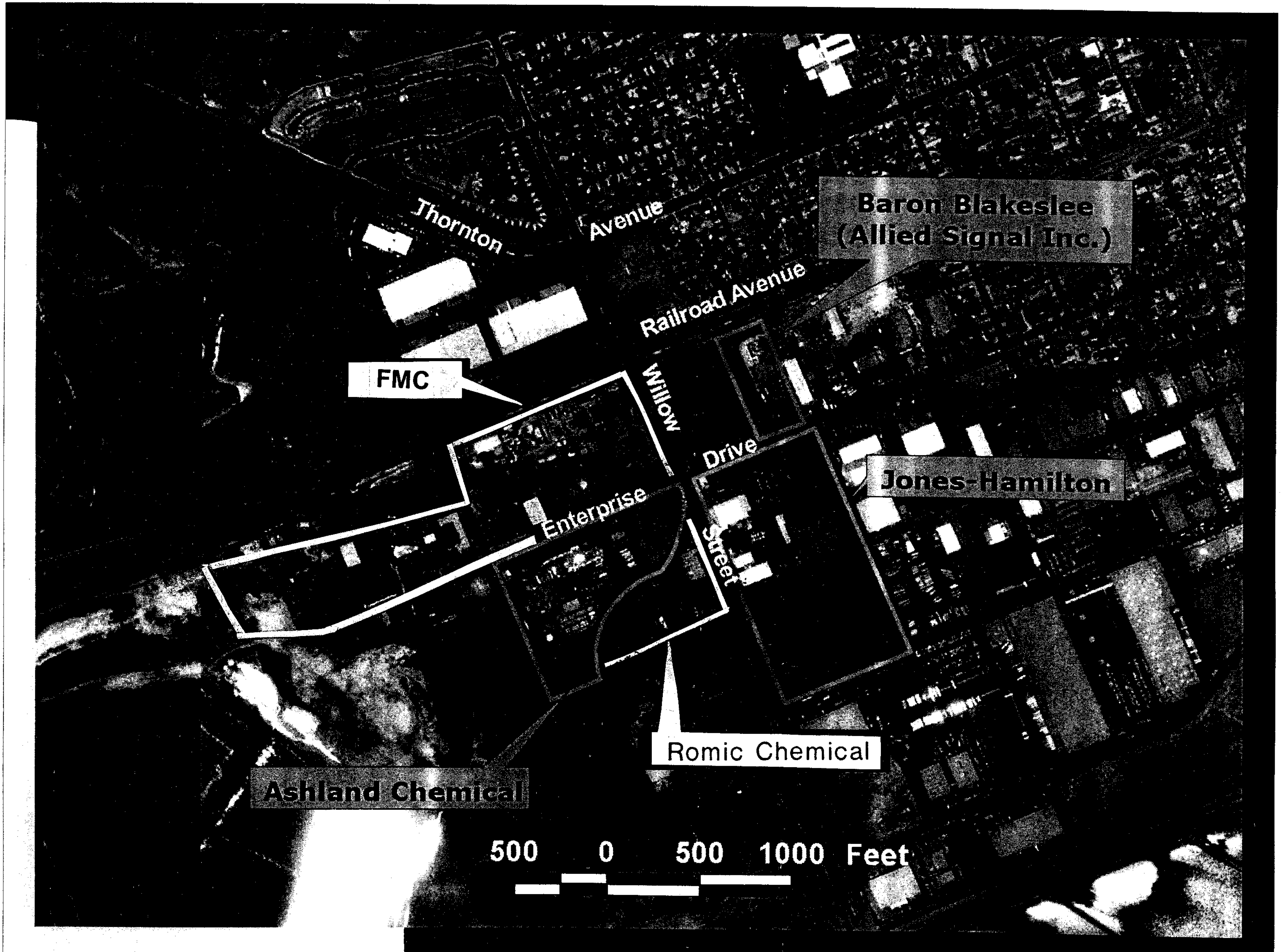
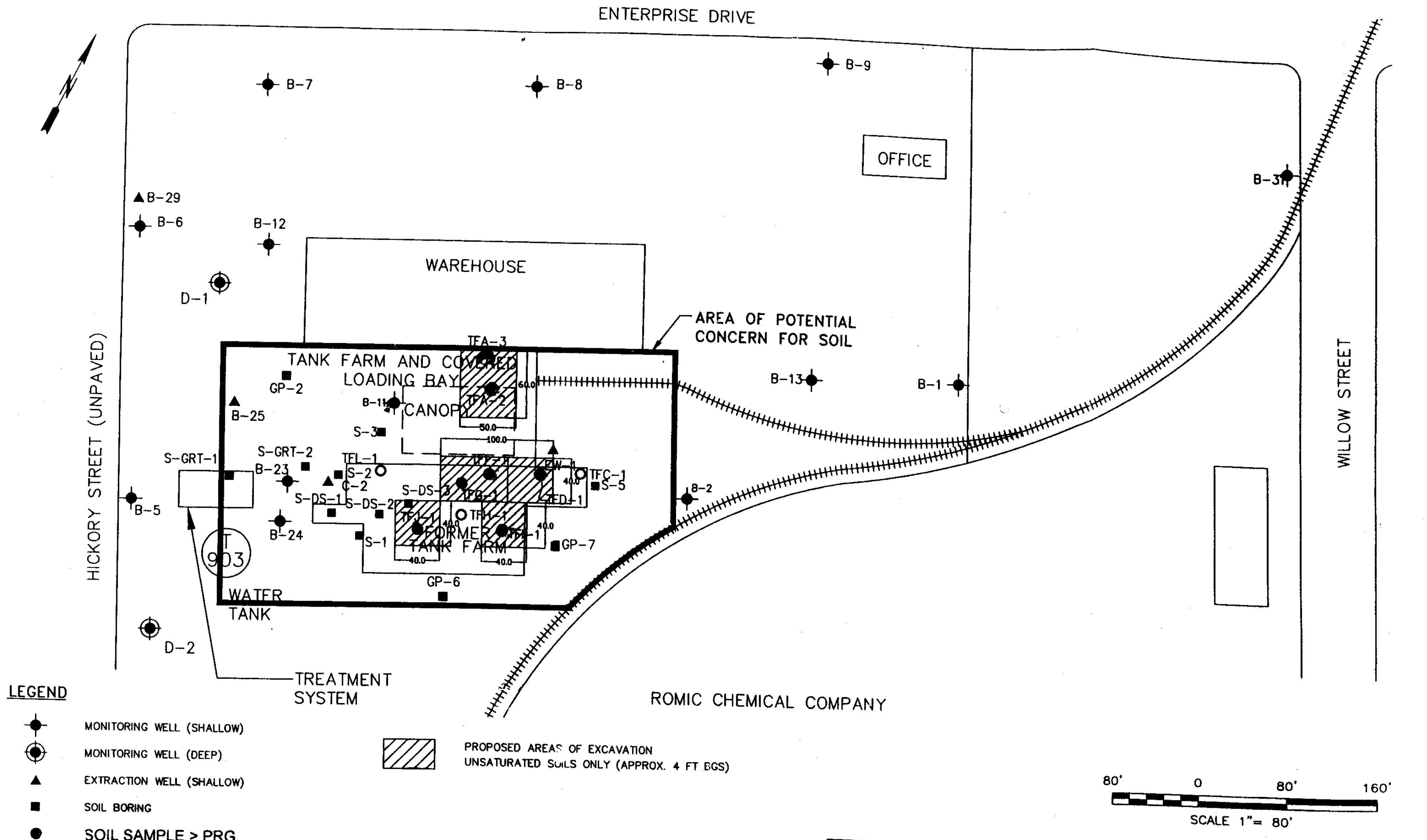



FIGURE 3 – FIVE VOC-IMPACTED SITES UNDER BOARD ORDER




| Project No. 82-01600075.00 | Ashland, Inc. 8610 Enterprise Dr. Newark, California URS | AREA OF CONCERN AND HISTORICAL SOIL CHARACTERIZATION SAMPLING LOCATIONS | FIGURE 4 |
|---|---|---|---|